

**U.S. FISH AND WILDLIFE SERVICE
SPECIES ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM**

SCIENTIFIC NAME: *Partula radiolata*

COMMON NAME: Guam tree snail, Pacific tree snail, or akaleha

LEAD REGION: Region 1

INFORMATION CURRENT AS OF: April 2010

STATUS/ACTION

☐ Species assessment - determined we do not have sufficient information on file to support a proposal to list the species and, therefore, it was not elevated to Candidate status

☐ New candidate

☒ Continuing candidate

☐ Non-petitioned

☒ Petitioned - Date petition received: May 11, 2004

☐ 90-day positive - FR date:

☒ 12-month warranted but precluded - FR date: May 11, 2005

☒ Did the petition request a reclassification of a listed species?

FOR PETITIONED CANDIDATE SPECIES:

a. Is listing warranted (if yes, see summary of threats below)? Yes

b. To date, has publication of a proposal to list been precluded by other higher priority listing actions? Yes

c. If the answer to a. and b. is "yes", provide an explanation of why the action is precluded.

Higher priority listing actions, including court-approved settlements, court-ordered and statutory deadlines for petition findings and listing determinations, emergency listing determinations, and responses to litigation, continue to preclude the proposed and final listing rules for the species. We continue to monitor populations and will change its status or implement an emergency listing if necessary. The "Progress on Revising the Lists" section of the current CNOR (<http://endangered.fws.gov/>) provides information on listing actions taken during the last 12 months.

☒ Listing priority change

Former LP: ☐

New LP: ☐

Date when the species first became a Candidate (as currently defined): November 15, 1994

☐ Candidate removal: Former LPN: ☐

☐ A – Taxon is more abundant or widespread than previously believed or not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status.

- ___ U – Taxon not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status due, in part or totally, to conservation efforts that remove or reduce the threats to the species.
- ___ F – Range is no longer a U.S. territory.
- ___ I – Insufficient information exists on biological vulnerability and threats to support listing.
- ___ M – Taxon mistakenly included in past notice of review.
- ___ N – Taxon does not meet the Act’s definition of “species.”
- ___ X – Taxon believed to be extinct.

ANIMAL/PLANT GROUP AND FAMILY: Snails; Family Partulidae (snail)

HISTORICAL STATES/TERRITORIES/COUNTRIES OF OCCURRENCE: Guam

CURRENT STATES/COUNTIES/TERRITORIES/COUNTRIES OF OCCURRENCE: Guam

LAND OWNERSHIP All but 8 of the 22 sites that currently support snails are on privately owned lands. The remaining sites are on lands owned by the U.S. Department of Defense (DOD), including one site that is within DOD lands managed by the U.S. Fish and Wildlife Service (Service) as the Guam National Wildlife Refuge (Refuge).

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LEAD FIELD OFFICE CONTACT: Pacific Islands Fish & Wildlife Office, Christa Russell (808) 792-9400, christa_russell@fws.gov

BIOLOGICAL INFORMATION

Species Description

The shell of the Guam tree snail (*Partula radiolata*) was described by Pilsbry (1909-1910) as “subperforate, oblong-tapering, the apex obtuse, thin; sculptured with distant impressed spiral lines; pale straw-colored, rayed with darker streaks and brown lines. Whorls 5, slightly convex, the last about equal to the spire, base tumid in front. The species’ columella is short, usually shortly receding. The species’ aperture is obliquely oval, glossy inside, and yellow; the peristome is simple, thin, white, expanded, the right margin somewhat straightened, columellar margin dilated above, and spreading above the umbilicus. The species’ length is approximately 19 millimeters (mm) (0.75 inches (in)), with a diameter of 10 mm (0.39 in), and an aperture ranging from 9 to 5 mm (0.35 to 0.20 in) inside.”

Taxonomy

The family Partulidae has three genera and 123 tree snail species and is restricted to the Pacific Islands. The genus *Partula* has four species found only in the Mariana Islands, and 94 additional species recorded from other Pacific islands. The Guam tree snail was first collected by Quoy and Gaimard during the French Astrolabe expedition of 1828 (Crampton 1925). Crampton’s 1925 taxonomic work is the most recent and accepted taxonomy for this species.

Habitat/Life History

The Guam tree snail prefers cool, shaded forest habitats (Crampton 1925; Cowie 1992; Smith 1995) with high humidity and reduced air movement that might otherwise promote excessive water loss. Crampton (1925) described the habitat requirements of the partulid tree snails of the Mariana Islands as, “a sufficiently high and dense growth to provide shade, to conserve moisture, and to effect the production of a rich humus. Hence the limits to the areas occupied by Partulae are set by the more ultimate ecological conditions which determine the distribution of suitable vegetation.” Crampton (1925) further described the intact structure of native Mariana forests as having four general levels: high trees; shrubs and *Pandanus*; cycads and taller ferns; and succulent herbs. He noted that the Mariana Islands partulid tree snails preferentially live on subcanopy vegetation and do not use the high canopy trees. Suitable habitat for the Guam tree snail was widely available on Guam prior to World War II and included coastal strand vegetation, forested river borders, and lowland and highland forests (Crampton 1925).

The biology of the partulid tree snails of the Mariana Islands has not been studied in detail. However, general information on the biology of closely related partulid tree snails has been published and reviewed by Cowie (1992) and the biology of all of these species is very similar. As with all terrestrial pulmonate (having lungs or lung-like organs) snails, the Mariana Islands tree snails are hermaphroditic. In general, partulid snails begin reproducing in less than 12 months and may live up to 5 years. Up to 18 young are produced each year and some species may be self-fertile. While most terrestrial snails lay eggs, the partulid tree snails give birth to live young. The snails are generally nocturnal, living on bushes or trees and feeding primarily on senescent or decaying plant material. There are no known natural predators of these snails, although many of these species are currently threatened by alien predators (Cowie 1992).

Historical Range/Distribution

The tree snail species of the family Partulidae are restricted to the high-elevation Pacific islands (Cowie 1992; Paulay 1994). The Mariana archipelago historically supported five species of partulid tree snails, and represents the northwestern limit of the geographical range of the Partulidae. The Guam tree snail is restricted to the island of Guam.

Current Range/Distribution

The Guam tree snail occurs on the island of Guam.

Population Estimates/Status

Currently, there are 22 known populations of the Guam tree snail. The total number of individuals is unknown. Crampton (1925) found the Guam tree snail at 37 of 39 sites surveyed on Guam and collected between 2 to 312 snails from each site. A total of 2,278 individuals were collected. The actual population sizes were probably considerably larger since the purpose of Crampton's collections was to evaluate geographic differences in shell patterns and not to assess population size. Since the work of Crampton (1925), no significant evaluation of the Guam tree snail occurred until the 1980s and 1990s. In 1989, Hopper and Smith (1992) resurveyed 34 of Crampton's 39 sites on Guam plus 13 new sites. Nine of the 34 sites resurveyed by Hopper and Smith (1992) still supported these snails in 1989. The Crampton site identified as having the largest remaining population of the Guam tree snail (estimated at greater than 500 snails) in 1989 has been completely eliminated by the combined effects of land clearing for a residential

development and a subsequent series of typhoons in 1990, 1991, and 1992 (Smith 1995). Hopper and Smith (1992) considered this species to be rare throughout its range and estimated that the number of sites that support the Guam tree snail have decreased by 74 percent since Crampton's work in 1920.

Of the 13 new sites (i.e., sites not identified by Crampton (1925)) surveyed by Hopper and Smith (1992), 7 supported populations of the Guam tree snail. However, one of these was eliminated between 1991 and 1992 by wildfires that burned into ravine forest occupied by the snails (Smith and Hopper 1994). Additional surveys by Smith (1995) found 5 additional populations of the Guam tree snail. Surveys of 15 sites on the Guam Naval Magazine located one additional population and shells of tree snails were found in abundance on the ground at all locations (S. Miller, Service, pers. comm. 2006). According to Smith (1995), there are 20 sites that still support small populations of the Guam tree snail. At one of these sites, snails were moved to a new location due to the development of a golf course on the tree snail habitat (Smith 1995). Surveys completed on Navy lands in 2008 indicated a decline in densities of this tree snail (C. Aguon, Guam Division of Aquatic and Wildlife Resources *in litt.* 2009).

Two new colonies of the Guam tree snail have recently been discovered. In 2003, a small colony (<100 snails) was found near the site of the new security gate for the Naval Base (B. Smith, University of Guam, pers. comm. 2006). A smaller colony (20 to 25 snails) was found in 2004 along the Lonfit River, near the Ordot landfill.

THREATS

A. The present or threatened destruction, modification, or curtailment of its habitat or range. Following World War II, open agricultural fields and other areas prone to erosion were seeded with *Leucaena leucocephala* (tangantangan), which grows as a single species stand with no substantial understory. The microclimatic condition in such areas is dry with little accumulation of leaf litter humus, and is particularly unsuitable as partulid tree snail habitat (Hopper and Smith 1992). Native forest cannot reinvade and grow where this alien weed has become established (Hopper and Smith 1992).

Typhoons are a common occurrence on Guam and have impacted the remaining forest on the island. The island of Guam has been affected by typhoons in 37 of the 50 years between 1954 and 2004 (Naval Pacific Meteorology and Oceanography Center Joint Typhoon Warning Center (JTWC) 2007). During the 1990s Guam experienced 20 typhoons, and supertyphoons (having gusts exceeding 150 miles (mi) (240 kilometers (km)) per hour) occur with regularity (about once every 5 to 10 years). The historical record for Guam shows increasing numbers of mild (estimated gusts in the range of 50 to 100 mi (80 to 160 km) per hour) and severe storms over the last three centuries, as well as in just the last decade (JTWC 2007). Vegetation changes associated with these storms have opened up forested areas that were excellent habitat for partulid tree snails. These open forests suffer from changes in microhabitat, such as desiccation, that make the continued survival of snails unlikely. These changes continue to occur today with each successive typhoon (F. Amidon, Service, pers. comm. 2005).

The structure of the limestone forest on Guam is slowly changing due to the presence of Philippine deer (*Cervus marianus*), feral pigs (*Sus scrofa*), and water buffalo (*Bubalus bubalis*), as they browse on seeds and seedlings retarding regeneration of the forest plants (Wiles *et al.* 1999). These ungulates have caused severe damage to native forest vegetation by browsing directly on plants, causing erosion (Marshall *et al.* 1995; Kessler 1997), and retarding forest growth and regeneration (Lemke 1992). This in turn reduces the quantity and quality of forested habitat for the Guam tree snail.

B. Overutilization for commercial, recreational, scientific, or educational purposes.

None known.

C. Disease or predation.

Predation by the alien rosy carnivore snail (*Euglandina rosea*) and the alien Manokwar flatworm (*Platydemis manokwari*) is a serious threat to the survival of all four species of partulid tree snails from the Mariana Islands. The predatory rosy carnivore snail is native to the southeastern United States, and was introduced into the Mariana Islands and Guam in 1957 (Eldredge 1988). Since being introduced, this voracious predator of snails has been dispersed by humans throughout the main islands.

The rosy carnivore snail was imported to these and other Pacific islands as a biological control agent for another alien snail, the giant African snail (*Achatina fulica*), which is an agricultural pest. However, while its effectiveness as a biological control agent against the giant African snail is questionable (Mead 1961; Tillier and Clarke 1983; Christiansen 1984), field observations have established that the rosy carnivore snail will readily feed on native Pacific island tree snails, including the Partulidae (Tillier and Clarke 1983; Murray *et al.* 1988; Miller 1993) and the Hawaiian achatinellid tree snails (Hadfield *et al.* 1993). A study of the diet of the rosy carnivore snail on the island of Mauritius in the Indian Ocean showed that this alien predator preferred native snails over the targeted alien giant African snail (Griffiths *et al.* 1993). On some or all of these tropical islands, the rosy carnivore snail has expanded its normal terrestrial feeding behavior to include native snails found in arboreal habitats (Murray *et al.* 1988; Hadfield *et al.* 1993; Miller 1993). The rosy carnivore snail has caused the extinction of many populations and species of native snails throughout the Pacific islands (Tillier and Clarke 1983; Murray *et al.* 1988; Hopper and Smith 1992; Hadfield *et al.* 1993; Miller 1993).

Predation on native partulid tree snails by the terrestrial Manokwar flatworm is also a threat to the long-term survival of these snails. This voracious snail predator was introduced into Guam in 1978 and has been spread by humans throughout the main Mariana Islands (Eldredge 1988). The Manokwar flatworm has also contributed to the decline of native tree snails, in part due to its ability to ascend into trees and bushes that support native snails. Areas with populations of the flatworm usually lack partulid tree snails or have declining numbers of snails (Hopper and Smith 1992).

D. The inadequacy of existing regulatory mechanisms.

Currently, no formal or informal regulatory protection is given to the Guam tree snail.

E. Other natural or manmade factors affecting its continued existence.
None known.

CONSERVATION MEASURES PLANNED OR IMPLEMENTED

Efforts are underway to update the status of snail populations in the Mariana Islands. On Guam an island-wide survey of terrestrial gastropods began in 2006. The University of Guam is seeking funding for additional surveys. Data from these surveys will be used to develop a wildlife conservation management plan for Guam snails (B. Smith, pers. comm. 2006).

SUMMARY OF THREATS

Based on our evaluation of predation by the nonnative rosy carnivore snail and nonnative flatworms, we conclude there is sufficient information to develop a proposed rule for this species. In addition, this species is threatened by habitat degradation and loss from typhoons and feral pigs, Philippine deer, and water buffalo, that browse on native forest plants and facilitate erosion, and by changes in microclimate conditions caused by the replacement of native limestone forest plants with monocultures of the nonnative tangantangan. We find that this species is warranted for listing throughout all its range, and, therefore, find that it is unnecessary to analyze whether it is threatened or endangered in a significant portion of its range.

For species that are being removed from candidate status:

___ Is the removal based in whole or in part on one or more individual conservation efforts that you determined met the standards in the Policy for Evaluation of Conservation Efforts When Making Listing Decisions (PECE)?

RECOMMENDED CONSERVATION MEASURES

- Conduct surveys for Guam tree snails
- Develop and implement nonnative snail removal and control program
- Develop and implement nonnative flatworm removal and control program
- Conduct habitat restoration
- Conduct ungulate (deer, pigs, and water buffalo) removal and control

LISTING PRIORITY

THREAT			
Magnitude	Immediacy	Taxonomy	Priority
High	Imminent	Monotypic genus	1
		Species	2*
	Non-imminent	Subspecies/population	3
		Monotypic genus	4
		Species	5
Moderate to Low	Imminent	Subspecies/population	6
		Monotypic genus	7
		Species	8
	Non-imminent	Subspecies/population	9
		Monotypic genus	10
		Species	11
		Subspecies/population	12

Rationale for listing priority number:

Magnitude:

The primary threat to the Guam tree snail by predation from nonnative predatory snails and flatworms is of high magnitude. These nonnative predators occur throughout the range of the Guam tree snail.

Immediacy of Threats:

The primary threat to this species from predation by nonnative predatory snails and flatworms is imminent because it is ongoing. These predators occur throughout the range of the Guam tree snail.

Rationale for Change in Listing Priority Number (insert if appropriate)

____ Have you promptly reviewed all of the information received regarding the species for the purpose of determining whether emergency listing is needed? Yes.

Is Emergency Listing Warranted? No. The species does not appear to be appropriate for emergency listing at this time because the immediacy of the threats is not so great as to imperil a significant proportion of the taxon within the time frame of the routine listing process. If it becomes apparent that the routine listing process is not sufficient to prevent large losses that may result in this species' extinction, then the emergency rule process for this species will be initiated. We will continue to monitor the status of the Guam tree snail as new information becomes available. This review will determine if a change in status is warranted, including the need to make prompt use of emergency listing procedures.

DESCRIPTION OF MONITORING

We conducted literature searches for recent articles on this species and contacted the Guam Division of Aquatic Wildlife and Resources (DAWR), regarding the current status of this species. No new information on the species' status was provided.

This level of monitoring is appropriate to update the status of the species because a thorough literature search was conducted as well as relevant species experts contacted. Information contained in this assessment form was verified and any updated information incorporated.

List of Experts Contacted:

Name	Date	Affiliation
Celestino Aguon	January 29, 2010	Guam Division of Aquatic Wildlife and Resources

This species is listed as critically endangered (CR) in the International Union for Conservation of Nature and Natural Resources (IUCN) Red Data List database (IUCN 2006). The Guam tree snail is included in the list of species in the Guam Comprehensive Wildlife Conservation Strategy (Guam Division of Aquatic Wildlife and Resources 2005).

COORDINATION WITH STATES

On January 29, 2010, we sent a letter to the Guam DAWR requesting their review and comment on our most recent candidate assessment of this species. No response was received.

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APPROVAL/CONCURRENCE: Lead Regions must obtain written concurrence from all other Regions within the range of the species before recommending changes, including elevations or removals from candidate status and listing priority changes; the Regional Director must approve all such recommendations. The Director must concur on all resubmitted 12-month petition findings, additions or removal of species from candidate status, and listing priority changes.

Approve:

Acting Carolyn D. Bohan 5/18/10
Regional Director, Region 1, Fish and Wildlife Service Date

Ronan W. Gould
ACTING
Director, Fish and Wildlife Service October 22, 2010

Concur:

Do not concur: _____
Director, Fish and Wildlife Service Date

Director's Remarks:

Date of annual review: April 16, 2010
Conducted by: Lorena Wada, Pacific Islands FWO
Biologist, Prelisting and Listing Program

Comments:
PIFWO Review

Reviewed by: Christa Russell Date: April 23, 2010
Prelisting and Listing Program Coordinator

Marilet Zablan Date: April 26, 2010
Assistant Field Supervisor, Endangered Species Division

Gina Shultz Date: April 30, 2010
Acting Field Supervisor